



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 :

G06K 19/07

A1

(11) International Publication Number:

WO 00/65534

(43) International Publication Date:

2 November 2000 (02.11.00)

(21) International Application Number: PCT/FI00/00352

(22) International Filing Date: 25 April 2000 (25.04.00)

(30) Priority Data:

990931

26 April 1999 (26.04.99)

FI

(71) Applicant (for all designated States except US): VALMET CORPORATION [FI/FI]; Fabianinkatu 9A, FIN-00130 Helsinki (FI).

(72) Inventors; and

(75) Inventors/Applicants (for US only): HASANEN, Kari [FI/FI]; Päivärinteentie 13 A 6, FIN-04250 Kerava (FI). KOIVUKUNNAS, Pekka [FI/FI]; Kauhavankuja 5, FIN-04430 Järvenpää (FI). VENETJOKI, Petteri [FI/FI]; Heinäpellontie 14A, FIN-00700 Helsinki (FI). LEPPÄKOSKI, Helena [FI/FI]; Sirukuja 6, FIN-04440 Järvenpää (FI). TORVI, Timo [FI/FI]; Wärtsiläkatu 76 B 40, FIN-04440 Järvenpää (FI).

(74) Agents: KAUSTE, Markku et al.; Leitzinger Oy, Ruoholahdenkatu 8, FIN-01800 Helsinki (FI).

(81) Designated States: AE, AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), DM, EE, EE (Utility model), ES, FI, FI (Utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published

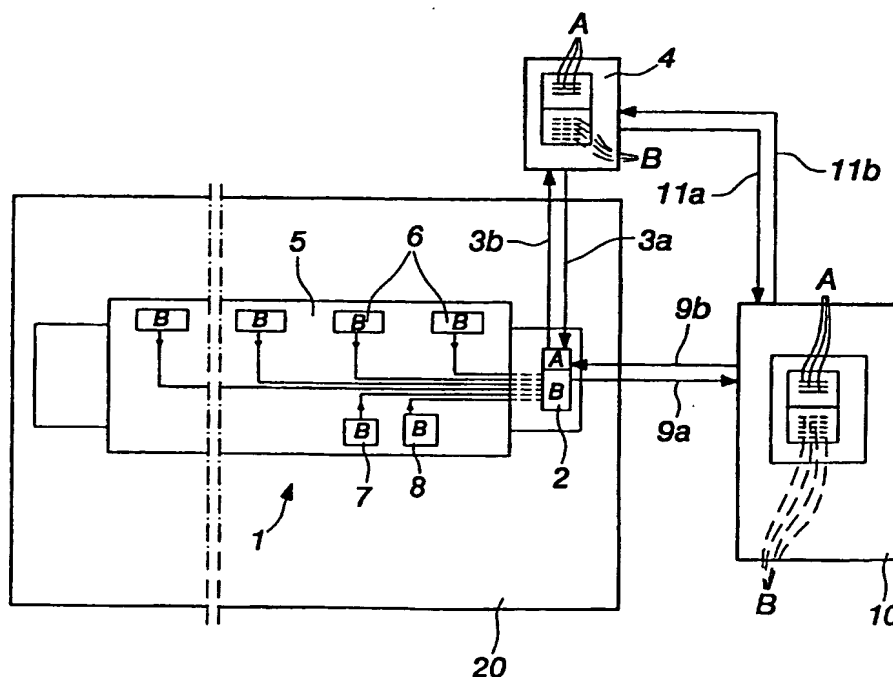
With international search report.

(54) Title: METHOD AND DEVICE FOR MONITORING AND STORING THE PROPERTIES OF VARIOUS COMPONENTS OF A PAPER/BOARD OR PULP AND FINISHING/CONVERTING MACHINE

(57) Abstract

The invention relates to a method for monitoring and storing the properties of various components (1) of a paper/board or pulp and finishing/converting machine (20) and the changes taking place in them and/or the ambient conditions and the changes taking place in them, and for transmitting this data to the control unit (10) of the paper/board or pulp or finishing/converting machine (20) and/or to a separate data processing system (4). In the component (1) is arranged a memory unit (2) accompanying it, in which can be written or which can be read electrically, by magnetisation or optically, in which memory unit are stored at least those properties (A) of the component (1) which affect the control values of a paper/board or pulp or finishing/converting machine (20). The method

and device also comprise data transmission means (9b, 3b) for transmitting the data stored in the memory unit (2) to the control unit (10) of a paper/board or pulp or finishing/converting machine (20) and/or a separate data processing system (4).



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Larvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon		Republic of Korea	PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

Method and device for monitoring and storing the properties of various components of a paper/board or pulp and finishing/converting machine

- 5 The present invention relates to a method and device for monitoring and storing the properties of various components of a paper/board or pulp and finishing/converting machine and the changes taking place in them and/or the ambient conditions and the changes taking place in them, and for transmitting this data to the control unit of the paper/board or pulp or finishing/converting machine and/or to a separate data processing system.

It should be mentioned that here control unit refers to a control unit at any hierarchical level of the paper/board or pulp and finishing/converting machine, that is, it may be, for example, the machine's central control unit or one of the control units in the machine's decentralised automation system.

Paper/board or pulp and finishing/converting machines comprise a large number of different components which have to be replaced and serviced due to, for example, wear and breakdown. For this reason, instead of using the components proper, temporary components have to be used, components have to be removed from the machine for the duration of servicing the component in question, or an old component has to be replaced by a new one. Often, the properties of temporary, serviced or new components which have an effect on the control values of the machine, do not correspond to the properties of the original component. Such components are, for example, the rolls of the machines mentioned above. For example, when the surface material of a roll wears to such an extent that it becomes too uneven, the roll is usually replaced by a spare roll, in which case the properties of the spare roll do not correspond fully to the properties of the original roll, such as weight, mantle diameter, surface material and deflection.

It is previously known to enter the properties of a new or serviced component in the control unit of the machine in order that the control values of the machine

can be changed, if necessary, to correspond to the said component. This is currently carried out manually, which is laborious. It has also be noted that errors occur in manual entry which, in the worst case, result in the breakdown of the component in question or another component of the machine, or in a
5 change in the quality of the production of the paper/board or pulp or finishing/converting machine due to an incorrect control value.

In addition, the data on the properties of the components, such as data on the diameter of the roll and other dimensional data, are written by hand on the
10 surface of the components, for example, with chalk, or on a separate piece of paper which is attached to the surface of the component, which means that the data on the properties of a component may be lost, for example, during storage or transportation of the component. In such a case, the properties of the component in question have to be measured or determined again.

15 Furthermore, during transportation, the component may be subjected to, for example, intensive accelerations and impacts. During storage, the component is also often subjected to changes in the ambient conditions, such as temperature and humidity. The properties of, for example, the surface materials
20 of rolls, such as polyurethane, change when subjected to temperature changes. Very often these changes are not noticed until they manifest themselves as disadvantageous changes in the quality of the end product, such as changes in the quality of paper in paper machines. Monitoring and storing the changes taking place in the properties of different components and the ambient
25 conditions and the changes taking place in them per component, for example, during the production run, storage or transportation is almost impossible by using known methods and devices.

The aim of the present invention is to achieve a method and device for
30 eliminating, or at least substantially reducing, the foregoing disadvantages.

To achieve these aims, the method relating to the invention is characterised mainly in that in the component is arranged a memory unit accompanying it, in

- which can be written or which can be read electrically, by magnetisation or optically, in which memory unit are stored at least those properties of the components which affect the control values of a paper/board or pulp or finishing/converting machine in connection with the manufacture or servicing of
- 5 a component in question, before the component is taken for installation into a paper/board or pulp or finishing/converting machine, or taken to be stored for later use, and that data transmission means are arranged for transmitting the data stored in the memory unit to the control unit of a paper/board or pulp or finishing/converting machine and/or a separate data processing system.
- 10
- The device relating to the invention is, on the other hand, characterised mainly in that in the component is arranged a memory unit accompanying it, in which can be written or which can be read electrically, by magnetisation or optically, in which memory unit can be stored at least those properties of the components
- 15 which affect the control values of a paper/board or pulp or finishing/converting machine in connection with the manufacture or servicing of a component in question, before the component is taken for installation into a paper/board or pulp or finishing/converting machine, or taken to be stored for later use, and that data transmission means have been arranged for transmitting the data
- 20 stored in the memory unit to the control unit of a paper/board or pulp or finishing/converting machine and/or a separate data processing system.

Preferred embodiments of the invention are disclosed in the dependent claims.

- 25 The invention is described in greater detail in the following, with reference to the appended drawings which show some embodiments of the invention, in which

30 Figure 1 shows diagrammatically a paper machine roll with a read/write memory unit.

Figure 2 shows diagrammatically a roll in a paper machine, which roll has a read/write memory unit.

Figure 1 shows diagrammatically a paper machine roll 1 and the main principles for monitoring and storing the properties A of the roll 1, the changes taking place in them, and the ambient conditions and the changes taking place in them. Roll 1 is, for example, a calender roll, the mantle 5 of which is coated with a polymer. In the roll 1, preferably in its axle, is arranged a read/write memory unit 2 in which are stored, in connection with the manufacture or servicing of the roll 1, those properties A of the roll 1 which affect the control values of the paper machine 20. Such properties A of the roll 1 are, for example, its diameter, weight, the deflection of the mantle 5, the composition of the surface material of the mantle 5, surface roughness, hours of operation of the roll, and the procedures carried out during the servicing of the roll 1, such as grindings.

The data on the properties A of the roll 1 are stored in the memory unit 2, for example, by means of a separate data processing system 4, such as a PC, located at the service point, from which the data in question on the properties A of the roll 1 are transmitted by the data transmission means 3a to the memory unit 2. Furthermore, the properties A stored in the memory unit 2 can be read in the desired form, for example numerically, by transmitting the data on the properties A of the roll 1 by means of data transmission means 3b to a separate data processing system 4.

The sensors 6, 7, 8 observing the state of the roll 1 and the ambience are in contact with the memory unit 2. The sensors 6 are, for example, piezoelectric power sensors arranged in conjunction with the coating of the roll 1 mantle 5, by means of which sensors is measured the nip force exerted on the roll 1 mantle 5, which force is generated in a paper machine between a roll 1 and a backing roll 1 (not shown). Sensor 7 is a temperature sensor and sensor 8 an acceleration transducer.

Sensors 6, 7, 8 and any other sensors observing the properties A of the roll 1 monitor the changes taking place in them. When a change takes place, for example, in the ambient temperature while the roll 1 is being stored, the

temperature sensor 7 detects the change, which is stored in the memory unit 2 in contact with the temperature sensor 7. Similarly, when the roll 1 is moved, for example, from the place of service to the paper machine 20, the Acceleration transducer 8 detects any impacts that take place during the transfer, which may
5 have a disadvantageous effect on the operating characteristics of the roll 1. The observation of the impact is also stored in the memory unit 2 in contact with the Acceleration transducer 8.

In general, therefore, between the manufacture or servicing of the component
10 and its installation in a paper/board or pulp or finishing/converting machine 20, the properties A of the component and any changes in the properties of the component, ambient conditions and changes B in the ambient conditions are stored in the memory unit 2.

15 Between the memory unit 2 arranged in conjunction with the roll 1 in connection with the installation of the roll 1 in the paper machine 20 and the control unit 10 arranged in conjunction with the paper machine 20 are provided data transmission means 9a, 9b (Figure 2). By these means, the above-mentioned data stored in the memory unit 2 are transmitted to the control unit 10 where they
20 can be read and processed. If necessary, the data can be transmitted from the control unit 10 to the memory unit 2. The data can be read and processed in a corresponding manner also by means of a separate data processing system 4.

The control unit 10 and the separate data processing system 4 are preferably
25 also connected continuously or temporarily with each other by means of data transmission means 11a, 11b. The foregoing data are transmitted by means of the data transmission means 11a from the data processing system 4 to the control unit 10 and by means of data transmission means 11b from the control unit 10 to the data processing system 4.

30

Consequently, absolutely correct data on the properties A of the roll 1 are provided, for example, for the control unit 10, and the data do not have to be entered manually as before. This also makes possible the observation or

determination of the state of the roll 1 on the basis of possible memory data B stored in the memory unit 2.

The component preferably also incorporates sensors observing the operating
5 conditions. In the rolls 1 relating to the disclosed embodiment, these sensors are thus, for example, piezoelectric sensors 6 arranged in conjunction with the roll mantle 5 and observing the nip force. The power sensors are also in contact with the memory unit 2, whereby the changes B in the nip force observed by the power sensors 6 are stored in the memory unit 2. Other
10 operating conditions may also be observed by corresponding provision of sensors. It is, for example, useful to observe the operating temperature.

Especially in operating conditions, the properties of the roll 1 (or other component) and its ambient conditions change often, and thus also much data
15 B relating to these changes is stored in the memory unit 2, which means that its memory capacity does not necessarily suffice to store all the data B. In such a case it is advantageous to have a "history of events" corresponding to a certain time period stored continuously in the memory unit 2. The memory unit 2 then contains preferably a certain amount of data stored at predetermined intervals
20 from each sensor 6, 7, 8, the data forming for each sensor 6, 7, 8 an essential, continuous "history of events" corresponding to a certain time period. At the same time as data is stored in the memory unit 2, the very oldest stored data is deleted at specific intervals.

25 It is obvious that the arrangement described above does not apply only to a paper machine roll, but can also be applied to various other components of paper/board or pulp or finishing/converting machines, such as bearings, doctor blades, coating head apparatus, etc. Neither is the provision with sensors limited to concern the type of sensor arrangements relating to the embodiment
30 described above.

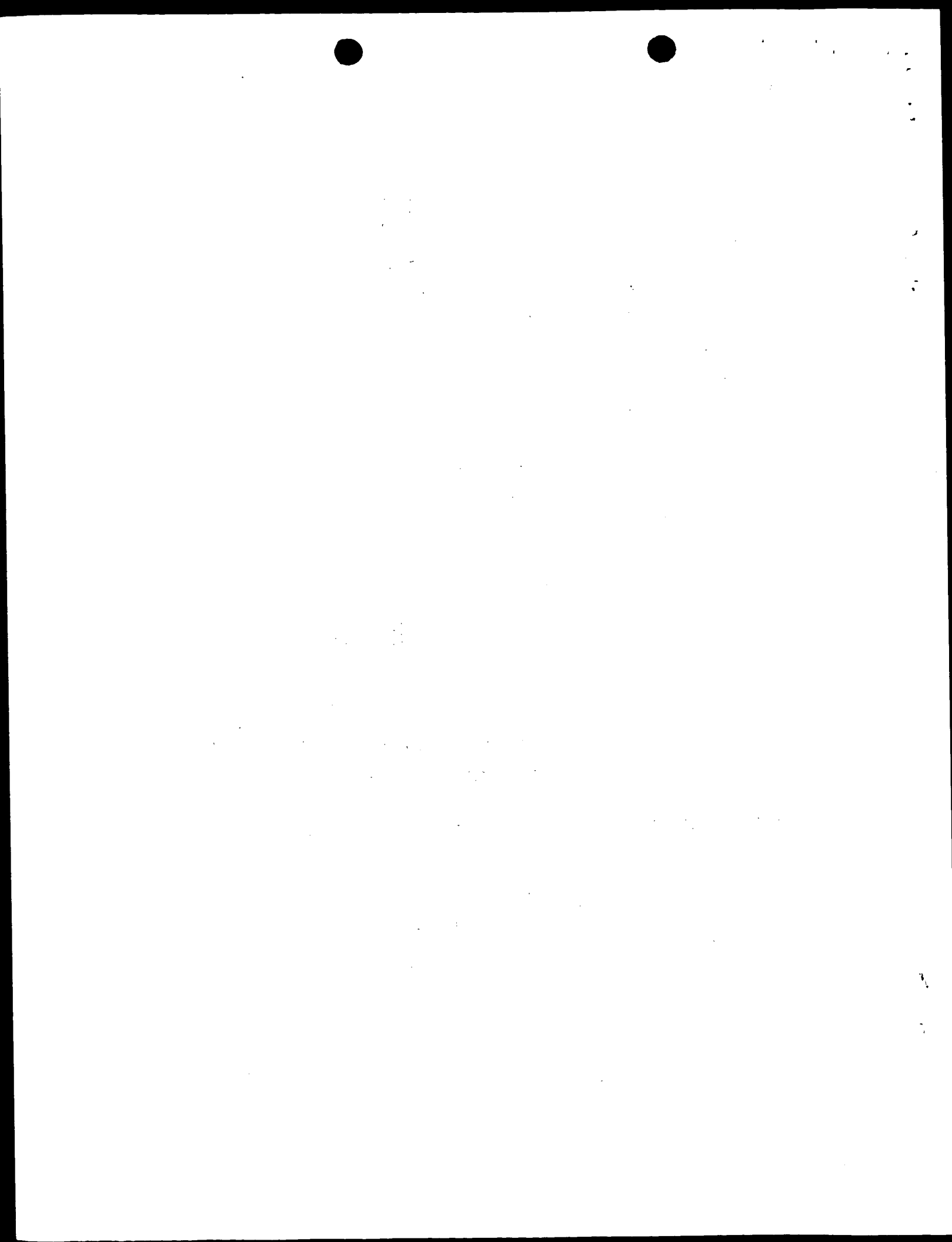
Claims

1. A method for monitoring and storing the properties of various components (1) of a paper/board or pulp and finishing/converting machine (20) and the changes taking place in them and/or the ambient conditions and the changes taking place in them, and for transmitting this data to the control unit (10) of the paper/board or pulp or finishing/converting machine (20) and/or to a separate data processing system (4), characterised in that in the component (1) is arranged a memory unit (2) accompanying it, in which can be written or which can be read electrically, by magnetisation or optically, in which memory unit are stored at least those properties (A) of the component (1) which affect the control values of a paper/board or pulp or finishing/converting machine (20) in connection with the manufacture or servicing of a component (1) in question before the component (1) is taken for installation into a paper/board or pulp or finishing/converting machine (20), or taken to be stored for later use, and that data transmission means (9b, 3b) are arranged for transmitting the data stored in the memory unit (2) to the control unit (10) of a paper/board or pulp or finishing/converting machine (20) and/or a separate data processing system (4).
2. A method as claimed in claim 1, characterised in that between the control unit (10) and the separate data processing system (4) are arranged data transmission means (11a, 11b) for transmitting data from the data processing system (4) to the control unit (10) and from the control unit (10) to the data processing system (4).
3. A method as claimed in claim 1 or 2, characterised in that the component (1) comprises at least one sensor (6, 7, 8) observing the state of the component (1) and/or its ambient conditions, which sensor is connected to the memory unit (2), and the data (B) obtained from which concerning changes in the component (1) and/or its ambient conditions are stored in the memory unit (2) in the component (1) in question.

4. A method as claimed in any of the claims 1 to 3, characterised in that in the memory unit (2) is continuously stored an amount of data (B) corresponding to a certain time interval which is obtained in an essentially uninterrupted manner from at least one observing sensor (6, 7, 8).
5. A device for monitoring and storing the properties of various components (1) of a paper/board or pulp and finishing/converting machine (20) and the changes taking place in them and/or the ambient conditions and the changes taking place in them, and for transmitting this data to the control unit (10) of the paper/board or pulp or finishing/converting machine (20) and/or to a separate data processing system (4), characterised in that in the component (1) is arranged a memory unit (2) accompanying it, in which can be written or which can be read electrically, by magnetisation or optically, in which memory unit can be stored at least those properties (A) of the component (1) which affect the control values of a paper/board or pulp or finishing/converting machine (20) in connection with the manufacture or servicing of a component (1) in question before the component (1) is taken for installation into a paper/board or pulp or finishing/converting machine (20), or taken to be stored for later use, and that data transmission means (9b, 3b) have been arranged for transmitting the data stored in the memory unit (2) to the control unit (10) of a paper/board or pulp or finishing/converting machine (20) and/or a separate data processing system (4).
6. A device as claimed in claim 5, characterised in that between the control unit (10) and the separate data processing system (4) have been arranged data transmission means (11a, 11b) by means of which data can be transmitted from the data processing system (4) to the control unit (10) and from the control unit (10) to the data processing system (4).
7. A device as claimed in claim 5 or 6, characterised in that in the component (1) has been arranged at least one sensor (6, 7, 8) observing the state of the component (1) and/or its ambient conditions, which sensor is connected to the memory unit (2), and the data (B) obtained from which

concerning changes in the component (1) and/or its ambient conditions has been arranged to be stored in the memory unit (2) in the component (1) in question.

- 5 8. A device as claimed in any of the claims 5 to 7, characterised in that in the memory unit (2) can be continuously stored an amount of data (B), corresponding to a certain time interval, which is obtained in an essentially un-
interrupted manner from at least one observing sensor (6, 7, 8).



JC10 Rec'd PCI/PTO 2 6 OCT 2007

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 00/00352

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G06K 19/07

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: G06K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EDOC, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4588880 A (P. HESSER), 13 May 1986 (13.05.86), column 4, line 49 - column 5, line 10, figure 1	1-2,5-6
A	--	3-4,7-8
X	US 4459590 A (D.C. SAULNIER), 10 July 1984 (10.07.84), abstract	1-2,5-6
A	--	3-4,7-8
X	WO 9118452 A1 (HENOCH, B.), 28 November 1991 (28.11.91), abstract	1-2,5-6
A	--	3-4,7-8

☒ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

- * Special categories of cited documents:
- "A" document defining the general state of the art which is not considered to be of particular relevance
 - "E" earlier document but published on or after the international filing date
 - "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
 - "O" document referring to an oral disclosure, use, exhibition or other means
 - "P" document published prior to the international filing date but later than the priority date claimed
 - "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
 - "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
 - "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
 - "&" document member of the same patent family

Date of the actual completion of the international search

20 July 2000

Date of mailing of the international search report

26 -07- 2000

Name and mailing address of the ISA:

 Swedish Patent Office
 Box 5055, S-102 42 STOCKHOLM
 Facsimile No. +46 8 666 02 86

Authorized officer

 Helena Rennermaim / MRo
 Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 00/00352

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FI 94562 B (ROBERTSSON, T.), 15 June 1995 (15.06.95), abstract --	1-8
A	US 4384288 A (C.A. WALTON), 17 May 1983 (17.05.83), figure 2, abstract --	1-8
A	US 4821198 A (K. TAKEUCHI ET AL), 11 April 1989 (11.04.89), figure 1, abstract -- -----	1-8

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/FI 00/00352

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4588880 A	13/05/86	DE 3234345 A EP 0103730 A	22/03/84 28/03/84
US 4459590 A	10/07/84	CA 1209710 A EP 0055639 A,B SE 0055639 T3 FR 2494935 A,B	12/08/86 07/07/82 28/05/82
WO 9118452 A1	28/11/91	AT 146318 T DE 69123576 D,T EP 0528962 A,B SE 500030 C SE 9001729 A US 5379042 A	15/12/96 26/06/97 03/03/93 21/03/94 15/11/91 03/01/95
FI 94562 B	15/06/95	AU 5422794 A FI 925077 A WO 9411846 A	08/06/94 10/05/94 26/05/94
US 4384288 A	17/05/83	NONE	
US 4821198 A	11/04/89	DE 3718215 A,C,R GB 2191026 A,B JP 62282848 A	03/12/87 02/12/87 08/12/87

10/1/77

10/2/77

10/3/77

10/4/77

10/5/77

10/6/77

10/7/77

10/8/77

10/9/77

10/10/77

10/11/77

10/12/77

10/13/77

10/14/77

10/15/77

10/16/77

10/17/77

10/18/77

10/19/77

10/20/77

10/21/77

10/22/77

10/23/77

10/24/77

10/25/77

10/26/77

10/27/77

10/28/77